Brown-Dwarf Companions to Solar-Type Stars from the Palomar Adaptive Optics Young Star Survey

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We present first results from a coronagraphic survey of young nearby stars using the Palomar adaptive optics (AO) system. The survey targets approximately 100 solar-type (F5–K5) stars at 20–160 pc from the Sun, spanning the 3–500 Myr age range, and is conducted in coordination with the *Formation and Evolution of Planetary Systems* (FEPS) Spitzer Legacy program. The survey is sensitive to sub-stellar companions at separations > 0.5" from their host stars, where the dynamic range at K-band exceeds 8 mag, with sensitivity extending to planetary-mass (5–15 M_{Jup}) objects achieved at wider separations (dynamic range exceeding 12 mag at > 2"). From multi-epoch astrometric and spectroscopic observations, we have discovered a confirmed L4 brown dwarf companion at a projected separation of 44 AU from a star in our sample. Because of its association with a young main sequence star, it is a member of a very limited list of known young (< 1 Gyr) L or T dwarfs, and as such can be used to constrain evolutionary models of ultra-cool objects. Over 100 other candidate companions, identified from first-epoch direct imaging, await confirmation. By combining our high dynamic range AO observations with radial-velocity monitoring of a sub-sample of our stars obtained as part of a separate program, we expect to extend our sensitivity to brown dwarf and planetary companions inward to small (several AU) separations. From future Spitzer/FEPS observations aimed at detecting debris disks in the same sample, we expect to broaden our knowledge of the interactions between sub-stellar companions and disks over scales spanning 0–1000 AU. This will in turn provide additional insights into the selection of suitable targets for TPF/Darwin.